

## State Transportation Innovation Council (STIC)

### STIC Business Meeting

**MEETING DATE:** Wednesday, November 17, 2021  
**TIME:** 9 a.m. – 11 a.m.  
**LOCATION:** Microsoft Teams Call  
**ATTENDANCE:** Refer to Attendance List

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### Welcome and Introductory Remarks

Anja Walker, PennDOT Bureau of Innovations (BOI), welcomed all attendees and called the meeting to order. Ms. Walker reviewed the ground rules for the meeting and the process for questions and comments. She provided an overview of the agenda and contents of the meeting booklet. Ms. Walker introduced the STIC Co-Chairs, PennDOT Secretary Yassmin Gramian, P.E., and Federal Highway Administration (FHWA) Pennsylvania Division Administrator, Alicia Nolan.

Ms. Gramian welcomed everyone to the November 2021 STIC Business Meeting and stated that as we enter another winter, we will continue to meet our challenges. Ms. Gramian is filled with optimism about the handling of the pandemic and the historic transportation bill just signed by the President. The infrastructure package, a once in a generation investment in our roads, bridges and the entire infrastructure system, will deliver billions of dollars to programs that will improve the safety of our people, grow the economy, create good jobs, enhance our competitiveness, and build a more robust, sustainable and resilient system for all of us. Earlier this month, PennDOT hosted its Virtual Innovations Days event that covered 56 innovations highlighting the advances we are making across the transportation industry. Ms. Gramian thanked PennDOT BOI for the tireless preparation and detailed oversight of the Virtual Innovation Days 2021, highlighting the attendance of more than 800 individuals.

Ms. Gramian introduced Alicia Nolan, FHWA Pennsylvania Division Administrator. Ms. Nolan stated Pennsylvania is embracing technology and innovation that is moving us into the future. She said that additional opportunities will continue to present themselves to help move us forward. Ms. Nolan thanked STIC members for their participation, and said she is looking forward to a great conversation today.

Ms. Walker thanked Ms. Gramian and Ms. Nolan for their opening remarks. Ms. Walker then introduced Clint Beck, P.E., and Yathi Yatheepan, P.E., both from the FHWA Pennsylvania Division Office.

### Federal Highway Administration Update

Mr. Beck discussed combining two part-time roles to form a new full-time role within FHWA. Mr. Beck introduced Mr. Yatheepan, Innovation and Research Coordinator, as the new face of FHWA at these meetings.

Mr. Yatheepan thanked Mr. Beck for the introduction. Mr. Yatheepan stated FHWA is very glad that PennDOT is embarking on two new Every Day Counts Round 6 (EDC-6) innovations, Crowdsourcing for Advancing Operations and Next Generation Traffic Incident Management: Integrating Technology, Data, and Training. Dan Farley will serve as the point of contact until the PennDOT Champions for both innovations have been identified.

Ms. Walker thanked Mr. Yatheepan and introduced Nicholas Vivian, P.E., PennDOT Bureau of Project Delivery, and Innovation Champion for CHANGE, an EDC-4 and EDC-5 innovation.

### **EDC-4 and 5 Innovation Spotlight – Collaborative Hydraulics: Advancing to the Next Generation of Engineering (CHANGE)**

CHANGE was chosen by FHWA for EDC-4 in 2017-2018, and it was chosen again for EDC-5 in 2019-2020. Through this initiative, FHWA encourages each state to shift from one-dimensional (1-D) hydraulic modeling to two-dimensional (2-D) hydraulic modeling. FHWA encourages the use of the SRH2-D program by providing funding and technical support to the states to make this transition easier. Pennsylvania has progressed from the demonstration stage to the assessment phase from January 2019 to December 2020. Currently, PennDOT is in the process of institutionalizing 2-D modeling. With the upcoming Design Manual Part II rewrite, there will be conditions where 2-D modeling will be required.

Mr. Vivian provided a quick review of 1-D modeling versus 2-D modeling. One-dimensional modeling forced designers to make assumptions about streamflow and potential flooding impacts. Calculations were averaged across cross-sections that were laid out along the stream, but those cross-sections had spacing or gaps in between. Two-dimensional modeling is a finite element analysis with a 3-D surface mesh that represents the actual topography of the channel. There are vectors that are calculated to the center of mass of each 3-D element. Instead of assuming the direction of flow being perpendicular to the cross-section like on a 1-D model, 2-D modeling performs a calculation that is no longer assumed.

Mr. Vivian presented complex hydraulic challenges that 2-D modeling helps solve. Most common on PennDOT projects are highly sinuous channels, multiple openings, multiple structures with split flow and confluence of flow in multiple channels. Using 2-D modeling, designers see stream flows and velocities around bridge structures and the potential impacts on the surrounding area. Thousands of elements are shown representing hydraulic flow and floodplain geometry.

To institutionalize this, each district was required to develop at least one 2-D hydraulic model for 2021. The Bureau of Project Delivery's Hydrology and Hydraulic Unit was assigned to assist each of the 11 districts in selecting and developing one project. Progress was affected by the COVID-19 pandemic due to the transition to remote working over VPN. Travel restrictions also complicated training and then PennDOT went through a Computer Aided Design (CAD) update from Microstation Inroads to Open Roads Designer, and it changed the way they process 3-D ground survey.

Mr. Vivian presented projects in PennDOT District 11, SR 0065, Section B34 Mercer Road Bridge Replacement Project in Beaver County and District 1, SR 4007, Section DF1, Over Tributary to Little Brokenstraw Creek Bear Lake Borough, Warren County.

One meeting participant asked about the additional time and resources required for the advanced model, and whether 2-D modeling will be the new normal or will part of the assessment process be to determine which model to use. Mr. Vivian stated that it is project dependent. On larger projects, due to the additional survey time and time to develop the model, the work hours will increase. At PennDOT, a lot of secondary channels, or tributaries, include the conditions where 2-D flow patterns exist. When PennDOT institutionalized the program, it was decided to choose smaller structures. The younger workforce picked up the technology very quickly and really negated any additional impact. Mr. Vivian also said it will be the new normal because advanced graphics and computer technology will only get better. The first step will be to evaluate the project and determine the appropriate model to use.

### **STIC Incentive Program Project Update**

Ms. Walker introduced William Howard, Pennsylvania Turnpike Commission, who presented the Using Unmanned Aerial Systems (UAS), or drones, for Crash Reconstruction project that received STIC Incentive Program funding in 2020.

Mr. Howard discussed procurement of resources, the locations where drones were used, what was purchased, what the crash reconstruction is going to do for PTC, training and certification and outcomes.

Mr. Howard stated that four drones were procured using the STIC Incentive Program funding and PTC match. An additional four systems were procured with PTC funds to provide coverage across most of the turnpike system.

For the purposes of crash reconstruction, the UAS can collect aerial imagery and benchmark image-based measurements. This aerial imagery, which is placed into the Pix 4D software, provides a better view of tire marks and maps out the scene from above.

All prospective UAS pilots have been provided with a link to the online training, which is at remotepilot101.com. Once training is completed, the prospective pilot will collaborate for testing with an FAA approved testing site.

Mr. Howard shared that all the equipment has been purchased and transferred to the site supervisor of the PSP Collision Analysis and Reconstruction Specialist Unit. All of the pilots have been provided the link to the training website, and one pilot has taken the test. The other seven pilots will be ready to test soon.

Four of the eight laptops have been imaged by PSP IT and training will be sent out shortly so all of those users can use the laptops. The training course has been established for the Pix 4D software, and it shows how to forensically map the scene with the drone. The intent is to hold a training class in January.

Once all the other pilots receive their certification, PSP anticipates a 75 percent decrease in reconstruction time. Use of UAS reconstruction, has shown to shorten the traffic incident management timeline, opening the roadway quicker, thus limiting backlog and other accidents in the backlog (2.8 percent increase in backlog per minute).

One meeting participant asked if PSP personnel that have been trained can use the UAS to investigate crashes on PennDOT's roadways also? Mr. Howard said yes, they can. Another question asked was whether the drone software automatically scans the site or does the operator have to guide it. Mr. Howard responded that the drones will take the pictures of the site, and then all pictures will be uploaded into the software.

Asked whether PTC can quantify the benefit of the 75 percent decrease in reconstruction time in terms of road user cost, Mr. Howard responded yes, I'm sure we can come up with some of those numbers. One final question was how ground control or scale is established when reconstructing an accident site for use later in taking measurements? Mr. Howard responded this information can be provided by others that have already used the software.

### **New STIC Innovations**

Ms. Walker thanked Mr. Howard and provided a brief introduction of four new STIC innovations for consideration:

1. Slotted Median Barrier
2. Environmental Monitor Role for Large Construction Projects
3. Standardized Color for Concrete Bridges
4. LED Lighted Plow Markers

Ms. Walker also mentioned that the most up to date STIC Innovation Status Tracker is included in the STIC Business Meeting booklet and provides additional information on all STIC innovations.

## Slotted Median Barrier

Ms. Walker introduced Chris Kufro, P.E., Assistant Design TAG Leader, to discuss the Slotted Median Barrier.

Mr. Kufro outlined the benefits of the Slotted Median Barrier. The Slotted Median Barrier was first developed by Texas A&M University. The large hydraulic opening on the bottom of the barrier is useful for flood prone areas. This barrier is potentially very useful for PennDOT.

Mr. Kufro stated that they are very close to moving forward with a single slope barrier into the RC standards (RC-57M). The Slotted Median Barrier has the same dimensions as the single slope barrier, but with an opening at the bottom. On flexible pavements, a six-foot drilled shaft, 18 inches in diameter, is required every 90 feet. On rigid pavements, the barrier must be anchored using rebars or some other type of anchor. Some of the other benefits include that it allows for access to inlets for maintenance, and the barrier does allow for some small wildlife to pass through.

One meeting participant asked whether this could be used as a center median, or a parapet along bridge crossings. Mr. Kufro said that he doesn't see a reason why we couldn't use it and added that you would have to develop the reinforcement to cast in place. Another participant asked if we could just add it to the RC standards now as an option for the districts to use in flood prone areas if using the Slotted Median Barrier is cost neutral. Mr. Kufro said that getting it in the RC standards is the goal and to evaluate it, as needed, on a case-by-case basis.

Ms. Walker thanked Mr. Kufro introduced Rachel Duda, P.E., Design TAG Leader, who presented the Environmental Monitor Role for Large Construction Projects and Standardizing Concrete Color on Bridges innovations.

## Environmental Monitor Role for Large Construction Projects

Ms. Duda stated that the Environmental Monitor Role for Large Construction Projects could benefit both big and small projects. For larger construction projects, the environmental monitor could help ensure the protection of sensitive environmental resources. The environmental monitor role is the onsite expert for concerns related to wetlands, streams, wildlife habitats and cultural resources.

The environmental monitor role requires an expert to be on site and manage the implementation of environmental mitigation elements of the project. The environmental monitor would coordinate with contractor and PennDOT staff on all environmental and permitting matters. They would also attend all environmental inspections and agency meetings as requested. Ms. Duda discussed the use of this innovation on the recent SR0083, Exit 4 project in District 8, and the lessons learned from this pilot project.

The confidence that sister agencies have will increase because the project will comply with all permits and other environmental needs, construction is in accordance with the approved design and there are no violations. This will lead to better compliance with regulations, fewer delays and cost savings. Better environmental oversight will lead to better projects.

One meeting participant asked whether this would be a new PennDOT, DEP or consultant role. Ms. Duda said this would not be a PennDOT or DEP role. It would be part of the construction contract, so the consultant would have the environmental monitor on their team. Another question was whether the environmental monitor would cover many small projects in a geographic area. Ms. Duda said that this is unclear because the same contractor would have to oversee all the projects. For a small project, there would have to be many environmentally sensitive areas to add the environmental

monitor to their contract. A final question was asked as to whether the environmental monitor would need to have any type of training or certification. Ms. Duda said that PennDOT would want them to have some level of technical expertise. There would definitely be a minimal level of training. She said that she will take the question back to the Design TAG to discuss further.

### **Standardized Color for Concrete Bridges**

Ms. Duda stated that PennDOT wanted to cut down on the number of colors on bridges and give a more consistent look across Pennsylvania. She discussed other examples of standards in place, including style guides for printed and online media.

There can sometimes be a prolonged “review loop,” where a manufacturer has trouble matching color or finding the correct shade of color. Standardizing the color of bridges would take away the guessing and save time by providing several colors from which to choose. PennDOT would make use of standard, off-the-shelf colors that manufacturers regularly produce. Developing this innovation will require coordination with the PennDOT’s Materials Unit, the districts, and updated to PennDOT Bulletin 15 listed suppliers. This would apply to paint, satin or a penetrating sealer. The goal would be to come up with a list of about 30 standard colors for PennDOT concrete bridges.

Aside from the economic benefits, one meeting participant asked if there are any visual reasons for standardizing the colors, such as complaints from the public, color harshness, etc. Ms. Duda responded no, that this will make everything more consistent and timelier. Another question was whether the one coat system referred only to concrete bridges. Ms. Duda said that this innovation is only for color on concrete for bridges. A final question was asked about whether other states have standardized colors for the bridges? Ms. Duda said she didn’t know but would check with the District 12 bridge engineer.

### **LED Lighted Plow Markers**

Ms. Walker introduced Dean Poleti P.E., Maintenance TAG Leader, to discuss LED Lighted Plow Markers.

Mr. Poleti stated that this innovation came from the STIC Network Showcase at the EDC-6 Virtual Summit. He stated that the challenge for our plow operators and the traveling public is that it is often difficult to see the end of the wing plows on either the left or right side of our snowplows as they are going down the road. It is particularly difficult during nighttime operations or when there’s a lot of heavy snow. The goal is to light it up to make it more visible to people. The solution is to add flexible lighted markers to the wing plow and front plow to increase visibility for the operator and the traveling public. Mr. Poleti presented examples of lighted plow markers from the Colorado, Minnesota and North Dakota DOTs.

A meeting participant asked whether the lighted plow markers would be used at all times of the day or just at night. Mr. Poleti responded that initially they would just be used at night, but daytime use could be evaluated later. He added that there would be an on/off switch inside the cab of the truck. Another question pertained to how the lighted plow markers are powered. Mr. Poleti said the lights would be powered by the battery of the vehicle itself and that a wiring harness would be required. The next question pertained to whether there are concerns with snow and ice buildup on the LEDs since they do not produce much heat? Mr. Poleti said there are no current concerns with buildup of snow or ice. He added that they have not found any issues with our existing plow markers, but will continue to study it. One final question related to any visibility concerns with glare from the LED lights. Mr. Poleti shared that there are two different LED light levels, the front of the marker strip is a bright LED, and the back of the marker strip is a dim LED, so it is not impeding vision of the plow operator.

Ms. Walker stated that since there were no objections to the new innovations presented, all four will proceed to the Detailed Development phase of the STIC Innovation Development Process, and the TAG Leaders will assign Innovation Owners to these new innovations and work with them to identify members for each respective Innovation Development Team.

## **STIC Innovation Updates**

### **Geosynthetic Stabilized Bridge Approach (GSBA)**

Dennis Neff, P.E., GSBA Innovation Owner, provided an update on this innovation. Smooth roads are a priority for PennDOT, so GSBA is an important and promising innovation. Mr. Neff reviewed the problem of the transition from bridge to roadway and bridge end settlement. Bridge end settlement includes “Bridge End Bump” and the troublesome bridge to roadway transition zone, including the backfill zone beneath the bridge approach.

Nationwide, 25 percent of bridges could suffer from bridge end settlement. In Pennsylvania, about 100 bridges a year would suffer from bridge-end settlement. Mr. Neff discussed the mechanisms that could contribute to bridge end settlement. Reinforcing the backfill zone to correct settlement as a cost-effective and efficient method of reducing long-term costs related to bridge end settlement.

Mr. Neff presented successful GSBA examples from other states and added that in 2016, District 2 began using GSBA, and in 2018, the STIC recognized GSBA as a cost-effective solution to reduce long-term maintenance costs. Since 2015, PennDOT District 2 has constructed more than 50 bridges using the GBSA technique; this has given engineers confidence that GBSA is an effective technique. Mr. Neff provided some example photos of how the GSBA is constructed. Mr. Neff also discussed research that Tennessee DOT conducted and how it helped PennDOT develop its standards.

Mr. Neff discussed two new standards: Roadway Construction Standard (RC-15) and Publication 408, Section 224. The Construction and Materials TAG also had to revise Section 505 of Publication 408 and the Bridge Design Standard (BD-628M). Full implementation of new GSBA standards and specifications are expected in 2022 after the clearance transmittal process is complete. Mr. Neff stated that the potential maintenance cost savings is approximately \$3 million annually statewide once the GSBA standards are in place. Additional benefits include improved safety (no work zones required) and improved customer satisfaction with smoother roads.

One meeting participant asked that if a bridge is constructed from beginning to end using the GSBA system, can the bump in the road can be completely avoided? Mr. Neff responded, yes it can.

### **Snowplow Cameras and Automated Vehicle Locator (AVL)**

Dean Poleti P.E., Maintenance TAG Innovation Owner, provided an update on Snowplow Cameras and Automated Vehicle Locator (AVL). The TAG is currently working with Geotab/AT&T/SmartWitness to install new Geotab devices in all PennDOT dump trucks across the state. Cloud service approvals were recently received for the SmartWitness camera system. The cameras will be piloted in approximately 30 to 40 dump trucks in PennDOT Districts 10 and 11. All vehicles will be equipped with maintenance video logs.

Already in use by the Minnesota DOT, Mr. Poleti said this will enhance the AVL system with the integration of plow cameras, enhance traveler information on 511PA, increase real time situational awareness for districts, county, area command and Pennsylvania Emergency Management Agency (PEMA) staff during snow events.



Mr. Poleti said the cameras will be mounted on the inside of the cab of the vehicle and capture images of the roadway directly in front of the vehicle and allow for the images to be seen in real time by maintenance managers using the AVL systems. One meeting participant asked if the plan is to provide the images to the public through 511PA. Mr. Poleti responded yes, that is the plan, so that the traveling public can click on a snowplow truck and see an image from that vehicle.

### **District 1-0 Right-of-Way Plan Development Process**

Ron Johnson, P.E., Design Services Engineer, PennDOT District 1, provided an update on the Right-of-Way Plan Development Process. Mr. Johnson credited Mr. Tom McClelland for helping to implement this innovation. The district noted that there was too much review time back-and-forth between the Design Unit and Right-of-Way Unit which caused a lot of frustration between the teams. The first step in the process was creating an employee participation opportunity to gather all the subject matter experts from District 1 to develop ways to improve and streamline the process. The next step was defining the project scope and purpose statement emphasizing communication, documentation and accountability in the development of the Right-of-Way plans.

Mr. Johnson stated that after the issues were defined, District 1 then drafted a process map with responsible parties identified. Through the effort, a total of 61 projects were reviewed between 2017 and 2019. The result is that the number of reviews has been reduced from six to two, and the overall review time from 14 months to 14 days. This results in an annual time savings of approximately 2,200 hours. District 1 has documented this process in a District Executive memorandum.

One meeting participant asked is the improved process is being used by other PennDOT districts. Mr. Johnson said he is not aware of the process being used by any other districts. A final question related to whether the 2,200 hours of annual time savings is just being realized by PennDOT only or does it account other for state agencies. Mr. Johnson said it was calculated for just PennDOT staff in District 1 for the additional reviews they did not have to do using the new process.

### **STIC Communication Update**

Ms. Walker provided a communication update. PennDOT held very successful Virtual Innovation Days on November 2-4, with approximately 850 attendees. Sixty-five speakers presented on a variety of topics. The event also included a Virtual Exhibit Hall with nearly 100 exhibits and is still available online at [www.penndot.gov/innovationdays](http://www.penndot.gov/innovationdays). The Virtual Innovation Days recordings are also available on the website.

The STIC will be celebrating its 10<sup>th</sup> Anniversary in 2022. The STIC is looking forward to celebrating the significant accomplishments of the STIC over this time. Please let BOI know if you have any ideas about how to celebrate.

Ms. Walker introduced Acting Executive Deputy Secretary Melissa Batula. Ms. Batula stated that she wants to continue the vision of George McAuley regarding embracing innovation and supporting the STIC. PennDOT is starting a George W. McAuley Innovation Award to recognize employee driven innovation groups to make sure the beat of innovation is incorporated into everything at PennDOT. Ms. Batula stated that we should be willing to take risks and not be afraid of failure. Ms. Batula commended the leadership of STIC for innovation.

The next STIC Business Meeting will be held at a yet to be determined date in 2022.

**The meeting adjourned at 11 a.m.**

## Attendance List

### STIC Members in Attendance

- Secretary Yassmin Gramian, P.E., PennDOT
- Division Administrator Alicia Nolan, FHWA
- Susan Armstrong, PACA
- Rodney Bender, P.E., PUC
- Nicholas Burdette, P.E., ACEC
- Stan Caldwell, CMU
- Stacey Cleary, PAAMA
- Eric Donnell, Ph.D., PSU
- Melissa Gates, CCAP
- Joseph Gerdes III, PSATS
- John-Thomas Graupensperger, PAEP
- Brad Heigel, P.E., PTC
- Domenic Rocco, P.E., PA DEP
- Ronald Seybert, Jr., P.E., APWA
- Joseph Szczur, P.E., University of Pittsburgh
- Mahmood Shehata, P.E., MASITE
- Karl Singleton, Pennsylvania Diversity Coalition
- Steven Thomas, AICP, Franklin County
- Alfred Uzokwe, DCNR

### PennDOT Leadership

- Melissa Batula, P.E., Acting Executive Deputy Secretary, PennDOT
- Michael Keiser, P.E., Acting Deputy Secretary for Highway Administration, PennDOT
- Michelle Jennings, Acting Deputy Secretary for Administration, PennDOT
- Larry Shifflet, Deputy Secretary for Planning, PennDOT
- Jennie Louwerse, Deputy Secretary for Multimodal Transportation
- Brian McNulty, P.E., District Executive, PennDOT District 1
- Thomas Zurat, P.E., District Executive, PennDOT District 2
- Sandra Tosca, P.E., District Executive, District 3
- Justin Blakeney, P.E., Assistant District Executive for Construction, PennDOT District 3
- Richard Roman, P.E., District Executive, PennDOT District 4
- Michael Rebert, P.E., District Executive, PennDOT District 5
- Louis Belmonte, P.E., Acting District Executive, PennDOT District 6

- Christopher Drda, P.E., Acting District Executive, PennDOT District 8
- Thomas Prestash, P.E., District Executive, PennDOT District 9
- Brian Allen, P.E., District Executive, PennDOT District 10
- Cheryl Moon-Sirianni, P.E., District Executive, PennDOT District 11
- William Kovach, P.E., District Executive, PennDOT District 12
- Rachel Duda, P.E., Assistant District Executive for Design, District 12

### FHWA Leadership

- Keith Lynch, Assistant Division Administrator
- Clint Beck, P.E., Director of Programs and Performance Management
- Yathi Yatheepan, P.E., Pavement and Materials Engineer

### Absent STIC Members

- Emily Bernzott Emm, P.E., WTS
- Aaron Hoover, APC
- Richard Jucha, P.E., ACPA
- Edward Troxell, PSAB
- C. Kim Bracey, DCED
- Brandon Carson, SAPDC
- Mark Compton, PTC
- John Gible, U.S. Army Corps of Engineers
- John Kibblehouse, Jr., PAPA
- Amy Sturges, PML
- Daniel Cessna, P.E., ASHE



### Follow-Up Tasks

	Item	Lead	Due Date	Status
1.	Crowdsourcing for Advancing Operations Kickoff Meeting to be scheduled	<b>FHWA</b>	<b>TBD</b>	<b>In Progress</b>
2.	Rachel Duda to follow up with what sort of technical training the Environmental Monitor Role would be required to have.	<b>Rachel Duda</b>		<b>In Progress</b>
3.	Check with Jeremy Hughes, District 12 Bridge Engineer, on whether other states have standard colors for concrete bridges.	<b>Rachel Duda</b>		<b>In Progress</b>
4.	Announce the dates for the 2022 STIC Business Meetings.	<b>BOI</b>		<b>In Progress</b>